REMARKS

In the present Amendment, claim 27 has been amended to recite that the diffusion barrier film contains silicon. Section 112 support for this amendment may be found, for example, at page 3, lines 23-24 and page 10, line 17 of the specification. No new matter has been added, and entry of the Amendment is respectfully requested.

Claims 27-32 and 34-35 are pending.

In paragraph No. 3 of the Action, claims 27, 29-32 and 34-35 are rejected under 35 U.S.C. § 103, as allegedly being unpatentable over U.S. Patent Application Publication No. 2004/0173908 to Barth et al ("Barth") in view of U.S. Patent Application Publication No. 2003/0067077 to Lee ("Lee") and U.S. Patent No. 6,313,517 to Lauterbach et al ("Lauterbach").

Applicants submit that this rejection should be withdrawn because Barth, Lee and Lauterbach do not disclose or render obvious the semiconductor device of the present invention, either alone or in combination.

The present invention defined by claim 27 as amended is characterized in that an adhesive film constituted by a silicon-based compound having an aromatic ring is provided between a diffusion barrier film which contains silicon (Si) and a low dielectric constant film which contains an organic low dielectric constant material, in order to obtain improved adhesion between the diffusion barrier film and the low dielectric constant film.

According to the present invention, since the adhesive film contains silicon, and the diffusion barrier film also contains silicon, the adhesive film has increased affinity to the diffusion barrier film. Furthermore, since the adhesive film contains an aromatic ring (i.e., organic component) and silicon, and the low dielectric constant film contains an organic low dielectric constant material containing silicon, the adhesive film has increased affinity to the low

dielectric constant film. Therefore, improved adhesion between the diffusion barrier film and the low dielectric constant film can be obtained.

Barth discloses that an adhesion promoting layer 118 is provided between a silicon nitride cap layer 117 which serves as a diffusion barrier film and an ILD layer 119. Regarding the material of the adhesion promoter layer 118, it is described in paragraph [0033] of Barth that the adhesion promoter layer is formed of AP4000 (Dow Chemical Company).

In paragraph [0033] of Barth, it is also described that if SILK is used for ILD layers 112 and 119, adhesion promoter layers 111 and 118 may be formed of an adhesion promoter known as AP4000. The SILK is an organic film, but does not contain silicon. The AP4000 is merely exemplified as adhesion promoter layer that is recommended by Dow Chemical Company to use with a SILK.

Therefore, Barth fails to disclose an adhesion film constituted by a silicon-based compound having an aromatic ring, as called for in the present claims.

Lee discloses that an organic copper diffusion barrier layer 118 is provided between a first dielectric layer 110 and a second dielectric barrier layer 120 or between a first copper layer 116a and the second dielectric layer 120. In paragraph 0019 of Lee, it is described that the material of the organic copper diffusion barrier layer 118 includes benzocyclo polymer, such as benzocyclobutene. It is not disclosed in Lee that the organic copper diffusion barrier layer contains silicon.

Benzocyclobutene is a compound in which a benzene ring is attached to a cyclobutene, thus the compound is an organic compound composed of only carbon (C) and hydrogen (H). Generally, organic compounds include numerous derivatives thereof, thus a silicon-containing benzocyclobutene is one of the genus of benzocyclobutene derivatives. However, since there are

numerous derivatives of such an organic compound, those skilled in the art would not be motivated to select a silicon-containing benzocyclobutene from the numerous benzocyclobutene derivatives in view of the disclosure of Lee.

In Lee, the dielectric layers comprise FLARE or SILK, which are organic dielectric layers which do not contain silicon, and the copper layer does not contain silicon. The organic copper diffusion barrier layer 118 is used in order to obtain increased adhesion to the dielectric layers or the copper layer, wherein the dielectric layer does not contain silicon, but is composed of an organic film, i.e. composed of carbon and hydrogen, and the copper layer does not contain silicon.

Lauterbach discloses a silicon-containing BCB (benzocyclobutene) derivative as an example of the BCB derivatives. Lauterbach also discloses in column 4, lines 10-13, that the BCB adhesive layer provides good adhesion to semiconductor, oxide, nitride and metal layers.

As discussed above, none of the cited references disclose an adhesive film constituted by a silicon-based compound having an aromatic ring being provided between a diffusion barrier film containing silicon and a low dielectric constant film being an organic low dielectric constant material containing silicon, to obtain improved adhesion between the diffusion barrier film and the low dielectric constant film.

Further, as discussed above, the organic copper diffusion barrier layer 118 of Lee is used for the purpose of obtaining adhesion between an organic layer such as a dielectric layer and a copper layer. Since these layers in Lee do not contain a silicon-containing organic compound, those skilled in the art would not have been motivated to use the organic diffusion barrier layer 118 in Lee to adhere the cap layer 117 and the ILD layer 119 in Barth. And since there are numerous benzocyclobutene derivatives, those skilled in the art would not have been motivated

to select a silicon-containing benzocyclobutene compound from the numerous benzocyclobutene derivatives in view of the disclosures of Lee.

Lauterbach discloses a silicon-containing BCB derivative, and the silicon-containing BCB is used in order to adhere to semiconductor, oxide, nitride and metal layers, which are not silicon-containing organic layers. Therefore, those skilled in the art would not have been motivated to use the silicon-containing BCB in Lauterbach as an adhesion promoting layer 118 of Barth for the purpose of obtaining increased adhesion to a cap layer 117 which contains a silicon and the ILD layer 119 which contains a silicon-containing organic compound in Barth.

Therefore, the present invention defined by claim 27 as amended and claims dependent therefrom are not obvious over Barth, Lee and Lauterbach.

In view of the above, reconsideration and withdrawal of the § 103(a) rejection of claims 27, 29-32 and 34-35 based on Barth in view of Lee and Lauterbach are respectfully requested.

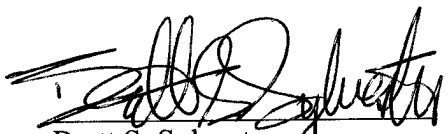
In paragraph No. 4 of the Action, claim 28 is rejected under 35 U.S.C. § 103 as allegedly being unpatentable over Barth, Lee and Lauterbach, and further in view of Applicant's admitted prior art.

Applicant submits that this rejection should be withdrawn for essentially the same reasons that the previous rejection based on Barth in view of Lee and Lauterbach should be withdrawn.

Allowance is respectfully requested. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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Date: November 16, 2007